29. (Once Amended) The apparatus, as recited in claim 2, wherein [each of the plurality of magnetic elements extends substantially from said first end of said process chamber to said chuck] the plasma is able to fill the entire process chamber in which the magnetic elements are disposed.

REMARKS

Claims 8, 13, and 29 have been amended. Claim 8 has been amended to recite that the magnets are within the plasma region. This is supported by page 6, lines 7 to 8, which says that the plasma fills the entire process chamber. Since the magnets are in the process chamber, they are in the region filled by the plasma. Claim 13 has been amended to recite that the sleeves shield the magnetic elements from plasma. This is supported on page 12, lines 1 to 9, of the application. Claim 29 has been amended to recite that the plasma fills the entire process chamber in which the magnetic elements are disposed. This is supported by page 6, lines 7 to 8, of the present application, as discussed above.

The Examiner rejected claims 2-7, 12, and 26-29 under 35 U.S.C. 102, as being anticipated by Moslehi et al. (U.S. Patent 5,464,499).

Claim 2 recites that the magnetic elements are disposed within the process chamber. The Examiner states that a wall defines a process chamber 10 of Moslehi within which the magnetic array 72 is disposed, within the process chamber. Moslehi does not disclose magnetic elements within a process chamber as recited in claim 2. The process chamber 10 of Moslehi has a first chamber defined by reactor outer wall 32 and plasma chamber collar 38, and a second chamber defined by the plasma chamber collar 38 alone. The first chamber of Moslehi defined by the reactor outer wall 32 and the plasma chamber collar 38 does not have plasma, since the plasma is blocked by the plasma chamber collar. The entire area of the second chamber defined by the plasma chamber collar 38 is able to have plasma. Page 6, line 7, of the present application states that the plasma tends to fill the entire process chamber moving to active areas and non-active areas. Therefore, the process chamber, as defined in the present application, would be analogous to the second chamber defined by the chamber collar 38 of Moslehi. The magnets 72 of Moslehi are outside of the process chamber, as so defined. For at least this reason, claim 2 is not anticipated by Moslehi.

The Examiner rejected claims 9 and 14 under 35 U.S.C. 103 (a) as being unpatentable over Moslehi in further view of Ye et al. (U.S. Patent 6,178,920). The Examiner stated that Moslehi lacks anticipation of having the magnetic elements contained within sleeves, but that Ye discloses magnetic elements in a non-sputtering jacket to prevent plasma within the processing chamber from sputtering, so that it would be obvious to modify the apparatus disclosed by Moslehi so that the magnetic elements are individually contained within sleeves to reduce contamination of the substrate.

Claims 9 and 14 are ultimately dependent on claim 2. In addition, it would not be obvious to use the sleeves of Ye on the magnetic elements of Moslehi. The magnetic elements 72 are shielded from plasma by the chamber collar 38, which prevents plasma from reaching the magnetic elements 72. If the plasma is not able to reach the magnetic elements 72 of Moslehi, it would not be obvious to shield them from the plasma. For at least these reasons, claims 9 and 14 are not made obvious by Moslehi in view of Ye.

The Examiner rejected claims 8, 10-11, 13, and 15-16 under 35 U.S.C. 103 (a) as being unpatentable over Moslehi in further view of Shan et al. (U.S. Patent 6,113,731) hereinafter Shan. The Examiner stated that Moslehi does not disclose the magnetic elements are electromagnets and their rotation to shift the magnetic field over time, but that Shan discloses the use of electromagnets for generating an electrically rotated magnetic field in order to reduce damage of the substrate being processed and increase radial uniformity of the plasma process and that it would be obvious to combine Moslehi and Shan to shift the magnetic field over time to optimize the process. The Examiner further states that Shan discloses that electromagnets may be replaced by permanent magnets and it would have been obvious to use electromagnets in Moslehi.

Claim 8 is dependent on claim 2 and has been amended to recite that the magnetic elements are within the plasma region. Moslehi teaches placing the magnetic elements outside of the plasma region in a chamber defined between the outer wall 32 and the chamber collar 38. For at least these reasons, claim 8 is not made obvious by Moslehi in view of Shan.

Claim 13 is dependent on claim 9 and has been amended to recite that the sleeves shield the magnetic elements from plasma. Since Moslehi uses the chamber collar 38 to

contain the plasma, it would not be obvious to use individual sleeves to provide shielding. For at least these reasons, claim 13 is not made obvious by Moslehi in view of Shan.

The Examiner rejected claims 10-11 and 15-16 under 35 U.S.C. 103 (a) as being unpatentable over Moslehi in further view of Tan et al. (U.S. Patent 5,795,451) hereinafter Tan. The Examiner stated that Moslehi does not disclose that the magnetic elements rotate to shift over time, but that Tan discloses magnetic elements that are rotated to shift the magnetic field over time in order for a more uniform processing of the substrate and that it would be obvious to combine Moslehi and Tan to mechanically rotate the magnetic elements.

Claims 10 and 15 are dependent on claims 5 and 2, respectively, and further recite moving at least one of the magnetic elements so that the magnetic field shifts over time. The Examiner stated that the motivation for combining Moslehi with Tan is to provide a more uniform processing of the substrate. It would not be obvious to combine the shifting magnets of Tan with Moslehi. Tan provides uniform processing by placing the substrate in the magnetic fields of the rotating magnets. The magnets of Moslehi are placed to provide magnetron enhancement. Nothing in Moslehi and Tan suggests that rotating such magnets would provide magnetron enhancement or provide more uniform processing. For at least these reasons, claims 10 and 15 are not made obvious by Moslehi in view of Tan.

Claims 11 and 16 are dependent on claims 5 and 2, respectively, and further recite where the magnetic elements are rotated. The Examiner stated that the motivation for combining Moslehi with Tan is to provide a more uniform processing of the substrate. It would not be obvious to combine the rotating magnets of Tan with Moslehi. Tan provides uniform processing by placing the substrate in the magnetic fields of the rotating magnets. The magnets of Moslehi are placed to provide magnetron enhancement. For at least these reasons, claims 11 and 16 are not made obvious by Moslehi in view of Shan.

Claims 3-7, 10-12, 15, 16, and 26-29 each depend either directly or indirectly from the independent claim, and are therefore respectfully submitted to be patentable over the art of record for at least the reasons set forth above with respect to independent claim. Additionally, these dependent claims require additional elements that when taken in the context of the claimed invention, further patentably distinguish the art of record. For example, claim 29, as amended, recites that the plasma is able to fill the entire plasma process

chamber in which the magnetic elements are disposed. For at least these reasons, claims 3-7, 10-12, 15, 16, and 26-29 are not anticipated or made obvious by the cited references.

Applicant believes that all pending claims are allowable and respectfully requests a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at telephone number (831) 655-2300.

Respectfully submitted,
BEYER WEAVER & THOMAS, LLP

Michael Lee
Registration No. 31,846

P.O. Box 778
Berkeley, CA 94704-0778

CLEAN VERSION OF PENDING CLAIMS

2. (Once Amended) A plasma processing apparatus for processing a substrate, comprising:

a process chamber, comprising:

a wall defining part of the process chamber;

a device for igniting and sustaining within the process chamber a plasma for said processing; and

a plasma confinement arrangement, comprising a magnetic array having a plurality of magnetic elements that are disposed within said process chamber, said plurality of magnetic elements being configured to produce a magnetic field, and wherein said plurality of magnetic elements are disposed around and extend along said plasma region.

3. The apparatus, as recited in claim 2, wherein said plurality of magnetic elements extend substantially from said first end of said process chamber to said chuck.

4. The apparatus, as recited in claim 3, wherein said magnetic field has an azimuthally symmetric radial gradient.

5. The apparatus, as recited in claim 4, wherein each magnetic element has a physical axis which extends along the plasma region.

6. The apparatus, as recited in claim 5, wherein each magnetic element has a magnetic axis which is substantially perpendicular to the physical axis.

7. The apparatus, as recited in claim 5, wherein said magnetic elements are permanent magnets.

B1 8. (Once Amended) The apparatus, as recited in claim 2, wherein said magnetic elements are within said plasma region.

9. The apparatus, as recited in claim 5, wherein said magnetic elements are individually contained within sleeves.

10. The apparatus, as recited in claim 5, wherein at least one of said magnetic elements is moved so that said magnetic field shifts over time.

11. The apparatus, as recited in claim 5, wherein said magnetic elements are rotated.

12. The apparatus, as recited in claim 2, wherein said magnetic elements are permanent magnets.

B2 13. (Once Amended) The apparatus, as recited in claim 9, wherein said sleeves shield said magnetic elements from plasma.

14. The apparatus, as recited in claim 2, wherein said magnetic elements are individually contained within sleeves.

15. The apparatus, as recited in claim 2, wherein at least one of said magnetic elements is moved so that said magnetic field shifts over time.

16. The apparatus, as recited in claim 2 wherein said magnetic elements are rotated.

17. A method for controlling a volume of a plasma while processing a substrate in a process chamber, said chamber defined at least in part by a wall, using a plasma enhanced process, comprising:

producing a magnetic field inside said process chamber with a magnetic array located inside said chamber;

creating said plasma inside said process chamber; and

confining said plasma within a volume defined at least in part by said magnetic field.

18. The method, as recited in claim 17, further comprising the step of supporting the substrate on a chuck in the chamber, wherein the substrate is spaced apart from a first end of said process chamber, and wherein the plasma is substantially confined in a plasma region between said first end of said process chamber and said substrate, and wherein said magnetic

array, comprises a plurality of magnetic elements disposed around and extending along said plasma region between said first end of said process chamber and said substrate.

26. The apparatus, as recited in claim 2, wherein at least one magnetic element extends substantially from said first end of said process chamber to said chuck.

27. The apparatus, as recited in claim 26, wherein the plurality of magnetic elements are disposed around and outside the periphery of the substrate.

28. The apparatus, as recited in claim 26, wherein the magnet elements are placed to create a minimum magnetic field at the substrate.

B3 29. (Once Amended) The apparatus, as recited in claim 2, wherein the plasma is able to fill the entire process chamber in which the magnetic elements are disposed.